MICROGRAVITY QUARTERLY

VOLUME 3 1993

VOLUME CONTENTS AND AUTHOR INDEX

PERGAMON PRESS Oxford · New York · Seoul · Tokyo

MICROGRAVITY QUARTERLY

Editor-in-Chief
Professor R. MONTI
Institute of Aerodynamics, Naples University, P. le V. Tecchio 80, 80125 Naples, Italy

Founding Editor
Professor L. G. Napolitano

Managing Editor
Dr C. Mirra, MARS Center, Via Diocleziano 328, 80125 Naples, Italy

Honorary Board

Dr H. Curien, 24 Rue de Fosset–St Jaques, 75005 Paris, France
Dr J. J. Dordain, ESA, 8–10 Rue Mario Nikis, 75738 Paris, France
Professor B. Feuerbacher, DLR, P.O. Box 90 60 58, D-5000 Cologne 90, Germany
Dr G. Greger, BMFT, Postfach 20 07 06, 5300 Bonn, Germany
Professor L. Guerriero, ASI, Viale Regina Margherita 202, 00198 Roma, Italy
Dr K. Higuchi, NASDA, World Trade Center Building, 2-4-1 Hamamatsu-cho, Minato-ku, 105 Tokyo, Japan
Professor D. T. J. Hurle, Royal Signals & Radar Establishment, St Andrew's Road, Great Malvern WR1 43PS, England
Professor I. Prigogine, Service de Chimie Physique II, Campus Plaine U.L.B.-CP 231, Bd. du Triomphe, 1050 Bruxelles, Belgium
Professor H. J. Rath, Center of Applied Space Technology and Microgravity, ZARM—University of Bremen, D-2800 Bremen 33, Germany
Professor F. Rossitto, ESA-EAC, P.O. Box 90 60 96, D-5000 Cologne 90, Germany
Professor R. Ruffini, Dipartimento di Fisica, Università "La Sapienza", Roma, Italy
Dr G. Seibert, ESA, 8–10 Rue Mario Nikis, 75738 Paris, France
Professor E. Vallerani, Alenia Spazio, Corso Marche 41, 10146 Torino, Italy
Dr H. S. Wolff, Clinic Research Center, Bioengineering Department, Brunel University, Uxbridge, Middlesex, England

Editorial Advisory Board

Dr P. W. Barlow, University of Bristol, Long Ashton Research Station, Long Ashton, Bristol BS18 9AF, England
Professor R. Bayuzick, Vanderbilt University, Box 6309, Station B, Nashville, TN 37235, U.S.A.
Professor A. Cogoli, ETH Hoenggerberg, 8093 Zürich, Switzerland
Professor P. Di Prampero, Facoltà di Medicina e Chirurgia, Istituto di Biologia, Via Gervasutta 48, 33100 Udine, Italy
Professor F. S. Gaeta, I.I.G.B. of CNR, Via G. Marconi 10, 80125 Naples, Italy
Professor G. Gershuni, Department of Theoretical Physics, Bukirev Str. 15, 614600 Perm, Russia
Professor Y. Malmejac, Centre d'Etudes Nucleaires de Grenoble, 38014 Grenoble, France
Professor S. Ostrach, Department of Mechanics and Aerospace, Case Western Reserve University, Cleveland, OH 44106, U.S.A.
Professor B. Roux, Institut de Mecanique des Fluides, 1 Rue Honnorat, 13003 Marseille, France
Professor Yuri Ryazantzev, Institute for Problems in Mechanics, Russian Academy of Sciences, 1 Michurinski Prospeckt, Moscow 117192, Russia
Professor A. Sanfeld, Service di Chimie Physique C.P. 231, Université Libre de Bruxelles, Boulevard du Triomphe, 1051 Bruxelles, Belgium
Professor S. Watanabe, Research Institute of Environmental Medicine, Nagoya University, Furo-cho, Chikusa-ku, Nagoya, Japan

Publishing Office

Pergamon Press Ltd, Pergamon House, Bampfylde Street, Exeter EX1 2AH, England (*Tel.* Exeter (0392) 51558; *Fax* (0392) 425370).

Subscription and Advertising Office

North America: Pergamon Press Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, U.S.A.; *Rest of the World*: Pergamon Press Ltd, Headington Hill Hall, Oxford OX3 0BW, England (*Tel.* Oxford (0865) 794141).

Back Issues

Back issues of all previously published volumes, in both hard copy and on microform are available direct from Pergamon Press offices.

Published quarterly in March, June, September and December

Copyright © 1993 Pergamon Press Ltd

Second class postage paid at RAHWAY NJ. Postmaster send address corrections to *Microgravity Quarterly*, Pergamon Press Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, U.S.A.

VOLUME CONTENTS

Volume 3, Number 1

A. Kaddame and **G. Lebon**	1	Overstability in Marangoni convection of an electrically conducting fluid in presence of an external magnetic field
Helmut F. Bauer and **Werner Eidel**	7	Hydroelastic vibrations in a rectangular container under zero-gravity
Cheng-Xian Liu, Jian-Ying Wang, Dun-Su Wu and **Zhang-Cheng Tang**	17	Adaptative responses of tobacco callus cells to simulated microgravity by compensation
R. V. Birikh, V. A. Briskman, V. I. Chernatynsky and **B. Roux**	23	Control of thermocapillary convection in a liquid bridge by high frequency vibrations
Z. Abdullah, M. Salcudean and **M. Savage**	29	Gas bubbles in low gravity—Part A. Generation of the bubbles
Z. Abdullah, M. Salcudean and **S. Lin**	37	Gas bubbles in low gravity—Part B. Transport of the bubbles
L. Carotenuto and **F. Mele**	47	Simulation of fractal aggregation in microgravity using cellular automata approach
V. I. Chernatynsky, G. Z. Gershuni and **R. Monti**	55	Transient regimes of thermo-vibrational convection in a closed cavity
	I	Calendar of Microgravity-related Events

Volume 3, Number 2–4

INTERNATIONAL SYMPOSIUM ON MICROGRAVITY SCIENCE AND APPLICATION

	vii	Foreword
	ix	Preface
	x	Scientific Committee
		PROGRAMMATICS
I. Barmin, A. Kazakova, E. Markov, V. Polezhaev and **V. Tatartchenko**	69	Russian microgravity activity
W. R. Hu and **W. C. Chen**	75	Progress of microgravity research in China

C. Mirra, J. Faulkner, Z. Saghir and **G. Rum**	81	Space Station Freedom Man Tended Capability: an opportunity for international cooperation. The example of Italy and Canada
C. Mirra	85	MARS Center: getting ready for the space station era
Da Dao-an	89	China's materials scientific experiments in space
		GENERAL MATERIAL SCIENCE
Yuko Inatomi, Takeshi Yoshida and **Kazuhiko Kuribayashi**	93	Real-time observation of faceted cellular growth
F. Ferguson, L. U. Lilleleht, J. Nuth, J. R. Stephens, E. Bussoletti, L. Colangeli, V. Mennella, P. Dell'Aversana and **C. Mirra**	97	An overview of the cosmic dust analogue material production in reduced gravity: the STARDUST experience
R. Monti, Y. G. Li and **G. Mannara**	101	Non-invasive measurement of surface temperature distribution in vertical free thin films during solidification
		CRYSTAL GROWTH
T. Nishinaga	109	Utilization of microgravity to understand the crystal growth of semiconductors
X. R. Zhong, L. Y. Lin, X. B. Li, C. J. Li, F. N. Cao, X. Xie, R. S. Xi, Z. L. Zhang, F. Y. Guo and **K. Wang**	115	Preparation of 24 mm diameter GaAs crystal in space
Flaviano Testa, Rosario Aiello, Alfonso Nastro, Luigi Carotenuto and **Rodolfo Monti**	119	Crystallization of silicalite from clear solutions
W. C. Chen, W. Y. Ma, Z. H. Mai and **A. Y. Xie**	125	Crystal growth of α-$LiIO_3$ from solution in space
Jin Weiqing, Chen Jinyuan and **Li Wensheng**	129	High temperature *in situ* observation of the melt transfer process around growing $KNbO_3$ crystals
D. H. H. Quon, S. Chehab, J. Aota, A. K. Kuriakose, S. S. B. Wang, M. Z. Saghir and **H. L. Chen**	135	Float zone crystal growth of bismuth germanate
Y. X. Shen, W. Y. Ma, W. C. Chen, Y. Chen and **B. X. Lu**	147	Study of concentration stratification in crystal growth of α-$LiIO_3$ by electronic speckle pattern interferometry

C. T. Tsai, M. W. Yao and **Arnon Chait**	151	Dislocation multiplication in GaAs crystals during GTE space processing
Peiwen Ge, Tatau Nishinaga, Chongru Huo, Zhengyi Xu, Jinpig He, Miyuki Masaki, Masako Washiyama, Xie Xie and **Risheng Xi**	161	Recrystallization of GaSb under microgravity during China Returnable Satellite No. 14 mission
A. Iwasaki, M. Hirata, I. Kudo, T. Sano, F. Mizukami, H. Takaya, M. Ito and **M. Watanabe**	167	ZSM-5 zeolite crystal growth in space

METALS AND ALLOYS

D. M. Herlach, B. Wei and **B. Feuerbacher**	173	Rapid solidification of undercooled Fe–Sn monotectic alloys
X. M. Zhang, Y. H. Wen, L. J. Rong, J. Z. Chen, Y. Y. Li, R. R. You and **W. R. Hu**	177	Influence of Marangoni convection on solidification microstructure of Al–RE alloy under microgravity
Hirohiko Nakamura, Masamichi Ishikawa, Sadaji Imura, Tuyoshi Suzuki and **Jun-ichi Yamaguchi**	183	Unidirectional solidification of succinonitrile under natural convection: effect of natural convection on moving boundary problem
B. Wei, D. M. Herlach and **B. Feuerbacher**	193	Rapid crystal growth in undercooled alloy melts
C. Patuelli and **R. Tognato**	199	Ground based preparatory activities to a microgravity experiment on the effect of the reinforcing phase on nucleation of aluminium matrix composites
Zhao Jiuzhou, Jia Jun, Li Qingchun and **Zhao Zhongmin**	205	Solidification of Al–Pb alloy under simulant microgravity conditions of electric and magnetic fields
Ming-Xiang Pan, Xi-Shen Chen, Ji-Rong Sun and **De-Qian Zhao**	209	Simulation of liquid phase separation processes of binary mixture system with an immiscible gap
Z. Liu and **H. Fredriksson**	215	On precipitation of TiC by reaction between graphite and Fe–Ti melts under μg
Zhi-cheng Qin, Hai-yang Bai, Ying-fang Xu and **Wen-kui Wang**	225	Microstructure and morphology of $Pd_{40}Ni_{40}P_{20}$ alloy solidified under microgravity
W. K. Wang, Y. F. Xu and **Z. L. Mao**	229	Nucleation, undercooling and formation of metastable phase of alloys in containerless drop tube processing

INSTRUMENTATION

Igor V. Barmin and **Alexander S. Senchenkov** — 233 Technological equipment of Splav Technical Center for producing materials in space. Some results of the experiments on crystal growth

G. Cambon, G. Hieu, P. Virlogeux, G. Cadet, M. Boddaert, Ph. Bioulez, F. Gonzalez, G. Benigni and **J. J. Favier** — 241 The MEPHISTO instrument: description, performance and preliminary flight technical results

V. De Chiara, H. Duwe, F. M. Sacerdoti, Ph. Willekens and **P. Jeanne** — 249 Microgravity experiment database ExpRes: an important tool for experiment design and evaluation

C. Mirra, P. G. Falciani, M. Tacconi, S. Musazzi, U. Perini and **F. Trespidi** — 255 The implementation of the BDPU optical diagnostic system in its functional model

E. Tillberg — 261 MUlti ZOne furnace for Photon

D. Bohle, J. Boßler, F. Claasen, H. P. Lüttenberg, H. Schürmanns, G. Fabritius, T. Hummel, R. Grätz and **W. Wiechmann** — 265 Guidelines to the safe design of furnaces on manned space missions

Chun-hui Liu — 277 Microgravity fluid mechanics drop tower facility

A. E. Kazakova, V. D. Kozlov and **A. V. Zapadnov** — 281 Space materials processing spacecraft development problems

287 Calendar of Microgravity-related Events

AUTHOR INDEX

Abdullah Z., 29, 37
Aiello R., 119
Aota J., 135

Bai H. Y., 225
Barmin I. V., 69, 233
Bauer H. F., 7
Benigni G., 241
Bioulez Ph., 241
Birikh R. V., 23
Boddaert M., 241
Bohle D., 265
Boßler J., 265
Briskman V. A., 23
Bussoletti E., 97

Cadet G., 241
Cambon G., 241
Cao F. N., 115
Carotenuto L., 47, 119
Chait A., 151
Chehab S., 135
Chen H. L., 135
Chen J. Y., 129
Chen J. Z., 177
Chen W. C., 75, 125, 147
Chen X. S., 209
Chen Y., 147
Cheng-Xian Liu, 17
Chernatynsky V. I., 23, 55
Claasen F., 265
Colangeli L., 97

Da Dao-an, 89
De Chiara V., 249
Dell'Aversana P., 97
Dun-Su Wu, 17
Duwe H., 249

Eidel W., 7

Fabritius G., 265
Falciani P. G., 255
Faulkner J., 81
Favier J. J., 241
Ferguson F., 97
Feuerbacher B., 173, 193
Fredriksson H., 215

Ge P. W, 161
Gershuni G. Z., 55
Gonzalez F., 241
Grätz R., 265
Guo F. Y., 115

He J., 161
Herlach D. M., 173, 193
Hieu G., 241
Hirata M., 167
Hu W. R., 75, 177
Hummel T., 265
Huo C. R, 161

Imura S., 183
Inatomi Y., 93
Ishikawa M., 183
Ito M., 167
Iwasaki A., 167

Jeanne P., 249
Jia J., 205
Jian-Ying Wang, 17
Jin W. Q., 129

Kaddame A., 1
Kazakova A. E., 69, 281
Kozlov V. D., 281
Kudo I., 167
Kuriakose A. K., 135
Kuribayashi K., 93

Lebon G., 1
Li C. J., 115
Li Q. C., 205
Li W. S., 129
Li X. B., 115
Li Y. G., 101
Li Y. Y., 177
Lilleleht L. U., 97
Lin L. Y., 115
Lin S., 37
Liu C. H., 277
Liu Z., 215
Lu B. X., 147
Lüttenberg H. P., 265

Ma W. Y., 125, 147
Mai Z. H., 125
Mannara G., 101
Mao Z. L., 229
Markov E., 69
Masaki M., 161
Mele F., 47
Mennella V., 97
Mirra C., 81, 85, 97, 255
Mizukami F., 167
Monti R., 55, 101, 119
Musazzi S., 255

Nakamura H., 183
Nastro A., 119
Nishinaga T., 109, 161
Nuth J., 97

Pan M. X., 209
Patuelli C., 199
Perini U., 255
Polezhaev V., 69

Qin Z. C., 225
Quon D. H. H., 135

Rong L. J., 177
Roux B., 23
Rum G., 81

Sacerdoti F. M., 249
Saghir M. Z., 81, 135
Salcudean M., 29, 37
Sano T., 167
Savage M., 29
Schürmanns H., 265
Senchenkov A. S., 233
Shen Y. X., 147
Stephens J. R., 97
Sun J. R., 209
Suzuki T., 183

Tacconi M., 255
Takaya H., 167
Tatartchenko V., 69
Testa F., 119
Tillberg E., 261
Tognato R., 199
Trespidi F., 255
Tsai C. T., 151

Virlogeux P., 241

Wang K., 115
Wang S. S. B., 135
Wang W. K., 225, 229
Washiyama M., 161
Watanabe M., 167
Wei B., 173, 193
Wen Y. H., 177
Wiechmann W., 265
Willekens Ph., 249

Xi R. S., 115, 161
Xie A. Y., 125
Xie X., 115, 161
Xu Y. F., 225, 229
Xu Z. Y., 161

Yamaguchi J.-i., 183
Yao M. W., 151
Yoshida T., 93
You R. R., 177

Zapadnov A. V., 281
Zhang X. M., 177
Zhang Z. L., 115
Zhang-Cheng Tang, 17
Zhao D. Q., 209
Zhao J. Z., 205
Zhao Z. M., 205
Zhong X. R., 115

Typeset in Great Britain by BPCC Techset Ltd, Exeter. Printed by BPCC Wheatons Ltd, Exeter